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Title of the Invention

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Unified Message System and Method

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Unified Message System and Method**CROSS REFERENCE TO RELATED APPLICATION**

5 This application claims priority from United States Provisional Application S/N
60/262,575 filed on January 18, 2001, which is hereby incorporated into the present
application by reference.

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BACKGROUND**1. Field of the Invention**

 The present invention is directed toward remote control of a host system with a
dual-mode mobile communications device (mobile device). Specifically a method is
15 disclosed for seamlessly integrating PBX services, including voice mail services, into a
mobile device for control by the user.

2. Description of the Related Art

 There are very few systems that allow remote control of host systems from mobile
20 devices. There are no known solutions that use a dual-mode mobile device to remotely
control PBX and voice mail systems. In the area of related art the closest solution known
to the author uses a browser-like method for controlling file viewing, file printing and file
re-routing like to a fax machine. Some of these solutions can also act like a terminal
emulator and thus allow the user to login to the company network and act like any other
25 terminal user. These types of solutions are very far from what is described in this patent.
In the field of phone technology there are also methods to call a service provider and turn
call forwarding on or off, and change the call forwarding number. In this area an

individual home phone, office phone, or cell phone can adjust some of the operating parameters but this has no multi-discipline effect on both voice and data information.

It is naturally possible to use two devices to perform some of the actions described in this patent, but these solutions have lots of problems and are prone to errors.

5 For example one device is inevitably turned off, or has out of battery, or is out of reach in a suitcase or a travel bag. The elegance of having full control over the PBX and voice system is the ideal solution. There is also the problem of costs for all these devices to solve problems of data and voice notifications. By adding costs and requiring multiple devices to solve simple problems the number of users will to purchase such a solution
10 goes down very quickly. Finally, there is a complete lack of elegance when two devices are required to deal with both voice and data to proper control over the host system. The mobile user expects simplicity and ease of use when deal with notifications, and acting upon notifications.

Therefore, there remains an important area of remote control of a host system,
15 from a dual-mode mobile communication device, that has not been satisfied.

SUMMARY

A unified messaging system, method and user interface is provided for a handheld mobile communication device. The method may include the following steps: (a) providing a unified event listing display comprising: a plurality of summary descriptors, each summary descriptor having one or more information elements to identify the event associated with the summary descriptor; (b) selecting one of the plurality of summary descriptors; (c) displaying a voice mail interface associated with the selected summary descriptor, wherein a plurality of voice mail actions are displayed on the interface; (d) selecting one of the plurality of voice mail actions; (e) communicating a voice mail command associated with the selected voice mail action to a unified messaging server via a wireless data communication network; (f) receiving the voice mail command at the unified messaging server; (g) executing an action associated with the received voice mail command at the unified messaging server; (h) establishing a circuit-switched communication connection to the mobile device from a PBX system associated with the unified messaging server; and (i) performing an action corresponding to the received voice mail command through the established circuit-switched communication connection.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an overview of where the invention is used in three different environments where PBX and voice-mail systems can reside;

Figure 2 shows one embodiment of the invention as used by a mobile device user to retrieve voice mail;

Figure 3 shows a second embodiment of the invention as used by a mobile device user to retrieve voice mail;

Figures 4a, 4b and 4c are examples of three control screens seen by the user of the mobile device when they interact with the unified messaging system;

5 Figure 5 is an overview of a wireless dual-mode device showing all the major hardware components in the system;

Figure 6 is an illustration of how conference call is established using the mobile device as the conference call initiator;

10 Figure 7 is an illustration of how an incoming call can be held and controlled by the user of a mobile device;

Figure 8 is a data flow diagram showing the steps necessary to request a voice-mail message by sending a data message to a unified messaging server;

Figure 9 is a data flow diagram showing the steps necessary to set up a conference call via a data message sent to a unified messaging server; and,

15 Figure 10 is a data flow diagram showing the steps necessary to process a held call via a data message sent to a unified messaging server.

DETAILED DESCRIPTION

A. OVERVIEW OF THE SYSTEM

With reference to Figure 1 this diagram provides an overview to the environment where the invention is used. The first component in the illustration is a dual-mode mobile device 100 ("mobile device"). This mobile device 100 is shown as having Radio Frequency ("RF") connections to both a data-Centric wireless network 150a and a voice-Centric wireless network 150b. The voice-centric network 150b preferably provides circuit switched communication connections. Although these networks are shown as separate, one skilled in the art will appreciate that it is now possible for a single network like GSM/GPRS to support both cell phone and data traffic through the same network infrastructure. Another component in Figure 1 is the unified messaging service 115, which can reside in many places. Unified messaging is well known in the field of land-line data communications, but its applicability to wireless mobile devices has not proceeded due to a lack of integration of functionality in the mobile device. In this context the unified messaging service can be used either in the corporate environment (A), the Application Service Provider (ASP) or Internet Service Provider (ISP) environment (B), or within the wireless network carrier location (C). Functionally the unified messaging service attempts to unify different sources of information and events for a given user. One goal of this unifying is to provide a single source for information, events, messages and voice traffic so that organization is simplified. As shown in Fig. 2, this unification may include a complete database and storage area 215 that contains messages and events that have been sent to the mobile device 100. Other major features

include: one addressing method to reach users, less time for information retrieval by the user of the mobile device 100 and an accurate chronological ordering to events and information on the mobile device 100.

5 B. REMOTE CONTROL OVER VOICE-MAIL SYSTEM

Turning now to Figure 1 there is presented three different information centers 105a, 105b, 105c all capable of communicating to a dual-mode mobile device ("mobile device") 100. Each information center has a set of services that could be used with a unified messaging service 115a, 115b, 115c to provide a range of information to the
10 mobile device 100. The unified message service 115 also co-ordinates the activities and notifications to the mobile device 100, through its links to the wireless network 150. The voice-centric wireless network, or more traditionally the cellular network, also provides the ability to reach each information center 105. For example a mobile device 100 can call into a voice-mail center, through a Private Automatic Branch exchange ("PBX") to
15 retrieve voice mail messages. This kind of activity is common for cell phone users today. For this mobile device 100, the cell-phone support is just one part of the functionality which resides within the mobile device 100 beside the data capabilities. These communication methods are not mutually exclusive and both could be operating simultaneously or cooperatively together on the same mobile device 100.

20 The components that make up a unified messaging solution can vary, depending on the sophistication of the unified messaging service and the goal of the service provider. Generally all services are protected by a firewall environment, this is especially important as most services are accessible through the Internet 135. Unified messaging

services 115 can include but is not limited to e-mail support, web site access and phone / voice-mail services. By leveraging the data component of the unified messaging service 115, the phone services component can provide notification and other types of features. Where necessary the unified messaging service 115 uses the Internet to exchange
5 information with the worldwide web, and with mobile devices 100. Within most corporate locations (A) the availability of phone services is standard. The corporation often has PBX access to allow the corporate phone system access to a certain capacity of phone circuits from the phone company. Many companies also purchase additional services with their PBX system. Such additional service include Interactive Voice
10 Response (IVR) systems to provide call routing, call services and voice-mail. When calls arrive into the corporate user, the system is programmed to ring the desktop phone of the user for a certain number of rings before sending the call to voice-mail. As shown in detail in Figure 2, the voice-mail component after receiving the voice-mail is then able to inform the user via a data command sent through the unified messaging service. In one
15 embodiment, the notification may be provided by adding a new voice-mail data element in the inbox of the user's unified inbox such as the inbox for users of Microsoft Exchange. In an alternative embodiment, this notification can take place through wireless e-mail, short messaging service (SMS), enhanced messaging service (EMS), multi-media messaging service (MMS) or the Internet Messaging Service (IMS). The invention can
20 also be used with an application service provider (ASP) or an Internet service provider (ISP) 105b. An example of an ASP service would include a private network like America On Line's ("AOL™") network, MSN.com, or some other 802.11 network standard-like LAN capable of exchanging information at extremely high rates. Within an

ASP or ISP 105b environment (B) there are a range of services 140 for customers of the ISP/ASP. As ISP's try to differentiate themselves they are finding it necessary to offer advanced portal, messaging and phone services. In this environment (B), similar to the corporate environment (A), there can be a unified messaging service available for mobile devices 100. The unified messaging service unifies all messaging and data services so that the mobile device 100 is able to present these events to the mobile device 100 user in a consistent and harmonious fashion.

Both the corporate location (A) and the ISP/ASP (B) have links to the Internet 135 for exchanging information with mobile devices 100, and for general Internet 135 access for information and content. This physical connection 130 would use a range of existing data communication technologies including but not limited to Ethernet, Cable Modem, DSL, ISDN, Frame Relay over any number of physical cables like T1 or fiber. These connections will not be discussed with other diagrams, as they are very well known by those skilled in the art.

The term wireless network 150 has been used in two contexts (1) the data-centric wireless network 150a and (2) the voice-centric wireless network 150b. For one skilled in the art, it has been stated that these two networks can be merged into one single network that can support both voice and data communications over the same physical network. The newest of these combined networks include, but are not limited to (1) the Code Division Multiple Access (CDMA) network , (2) the Groupe Special Mobile or the Global System for Mobile Communications (GSM) and the General Packet Radio Service (GPRS) both developed by the standards committee of CEPT, and (3) the future third-generation (3G) networks like EDGE and UMTS. GPRS is a data overlay on-top of

the very popular GSM wireless network. Some older examples of data-centric network include, but are not limited to: (1) the Mobitex Radio Network ("Mobitex"), which has been developed by Eritel and Ericsson of Sweden, and is operated by Cingular in the United States, and (2) the DataTAC Radio Network ("DataTAC"), which has been developed by Motorola and is operated by American Mobile Satellite Corporation (AMSC) now called Motient, in the United States.

The network carrier location (C) 105c preferably includes the necessary infrastructure that makes up the wireless network 150, and other supporting computers. For one skilled in the art the components within the wireless network 150 are well known and include base stations, and routing nodes like SGSN and GGSN nodes in a GSM/GPRS network. As network carriers are trying to differentiate their services, and acquire greater revenue from the wireless user, they are installing value-added services 145. These include unified messaging services 115c, Internet services like portals 145b and phone services 145c. A phone service, to support basic calls to cell phones, has been part of cellular networks since their creation. Some of services include, but are not limited to: voice-mail support, call forwarding, call holding, call waiting and advanced 411-call dialing. Network carriers 105c are also installing advanced services that support inter-connection between services. This allows for voice-mail systems to inform mobile device 100 users when voice-mail messages have been deposited into their voice-mailbox. This invention then allows these same users to take the next step and act upon that notification seamlessly from their mobile device.

With reference to Figure 2 this overview diagram illustrates how a unified messaging service can interoperate with the PBX and voice-mail system to give the user a

user-friendly remote control over that voice mail system from the user's mobile device. Using the unified messaging system 115 as a focus, this Figure illustrates how a notification message can be sent out, through an interface to the voice-mail system, to a mobile device 100. After reception the mobile device 100 can react to the notification in a way that seamlessly causes the voice-mail system to play the voice-mail message without necessarily downloading over-the-air that voice-mail message onto the mobile device.

Turning now to Figure 2 there is a much more complex illustration of all the data exchanges and relationships between the various components of the system. Figure 2 also shows the relationship between the unified message sub-system and other sub-systems like e-mail and PBX systems. The PBX system 120 links to local telephones 125, and supports plain old telephone service (POTS) lines 235. When used within a network carrier environment, the PBX system 120 might also provide SS7 gateway support for cell phone connections. Voice-mail support has a data store 225 for saving voice messages and other IVR configuration data. E-mail connections might use Internet standards like POP3 or IMAP4 to Unix mail systems, or proprietary interfaces like Microsoft's MAPI, or Lotus Notes API for corporate mail servers. Corporate e-mail servers like 'Microsoft Exchange TM, or Lotus Notes TM are just two of the hundreds of e-mail systems available in the marketplace today.

In this first embodiment, the first step (1) is the arrival of incoming phone calls for a given user, that is out of the office. These phone calls 230 can be coming from the outside world, over a T1 line or some other truck line, or coming from other phones 125 within the company PBX system 120. The company's PBX system 120 gets no answer at the user's desktop and performs step (2) by sending the call to the voice-mail system 225.

This voice-mail system may be a direct part of the existing PBX, or an added solution, i.e. a separate physical computer system. The PBX and voice-mail system 120 will place the call in the user's voice-mail mailbox 225 until it is played, forwarded, deleted or accessed in some other action by the user. Naturally, the voice-mail solution 120 stores a large number of voice mail messages, and each voice message is given an identifier or reference number so the user can proceed through them in an orderly fashion. Interfacing to the voice-mail system is a voice-mail interface 210c, which uses an Application Program Interface (API) to interact with the voice-mail system and the PBX system. This is similar to the API used to access mail 210b, previously referenced as POP3 or IMAP4. Additionally, a web interface might exist 210a for access Internet content and web pages.

At step (3) the voice-mail interface 210c detects the arrival of a new voice-mail message saved in the message store 225. If there is a mobile device 100 configured for that voice-mail mailbox, then the unified messaging system 115 sends a notification message of the call to the mobile device 100. Configuration information for the unified messaging system is preferably kept within a database for all mobile device 100 users 215. In one embodiment, this database might have both configuration information and actual messages being delivered to mobile devices 100. These messages serve as references for the user in case they want to perform additional functions, like getting more data of an e-mail message. The notification message is sent to the mobile device 100 through the Internet via the wireless network; except if the unified messaging server 115 resides in the network carrier's infrastructure domain, then it can send directly to the mobile device 100 via the wireless network. The notification message preferably includes one or more of the following pieces of information:

- message waiting indicator – this is an indicator or flag in the header of a the notification message. Where a SMS message means is used as the notification message, the message waiting indicator indicates it is a voice mail notification type of SMS message.
- 5 - Voice-mail message reference identification – this uniquely identifies the message within the user’s voice mailbox at the user’s voice mailbox.
- Voice-mail access telephone number – for calling back into the voice mail system.
- Caller ID - calling line identity of the caller who left the voice mail message, if available.
- 10 - Date and time of call

The summary message preferably contains information like the caller id, message call length, message reference number, time it was received and any other information it can get from the caller information. In an alterative embodiment, the unified messaging component is fully integrated into the PBX and voice-mail system 120. In this embodiment, there is only one piece of software that performs both these functions.

Once the user has received the summary message of the voice mail message on the mobile device 100 they are notified using several methods. The device might begin to vibrate, it might give an audible tone or a combination of both. The user then has the

option of responding to the message by opening it and performing the next action. The user might also choose to ignore the message and it will reside in the unified event listing 250 that shows all voice and data events in a single event listing. The unified event listing is preferably a reflection of the events that occurred in the unified messaging server 115

5 (such as, but not limited to incoming email messages received at the user's account at the user's office, faxes received at a fax number associated with the user, voice mail messages) and within the mobile device 100 by the user (such as, but not limited to outgoing email messages generated at the mobile device, telephone call logs). This list can be sorted by the user to show all chronological events, only outgoing e-mail events,

10 only outgoing phone events, incoming phone events or any other category of event available on the mobile device 100. A summary message or summary descriptor preferably comprises of one or more information elements. In a preferred embodiment, the one or more information elements includes one or more of the following: an graphical icon, a time stamp of when the event was received on or transmitted from the mobile,

15 subject line and sender's name.

In this embodiment, the next step occurs when the user of the mobile device 100 opens the voice-mail summary message to listen to the message. A summary of one type of visual display used on the mobile device 100 is shown in Figure 4a. In this screen the user has exposed a menu of actions 255 that allows the user to perform an action on an

20 item in the unified event listing. As illustrated, the user has already selected an item in the list, shown by the arrowhead. The methods to perform this action might include, but are not limited to using: a touch-screen interface, a roller wheel, a mouse button, cursor keys or some other navigation method. In this situation, the user further selects the "Open

Item" action and reveals all the details of the event, which causes Figure 4b to appear to the user. In this example the detailed information provided in the voice mail message 260 shows the caller id, a matching address book entry for the caller id, if present, the recorded message length, and the time the call was taken. For one skilled in the art, there could be many other screen presentations and choices. In this example, the user can select Delete, Cancel or Play/Connect. The delete selection could mean to delete the locally stored voice mail summary message, or both the locally stored voice mail summary message and the associated voice mail message stored in association with the voice mail server. The cancel selection could possibly clear this dialog box and return to the unified event listing 255. The play/connect selection might either play the message, or connect to the PBX and voice-message system 120. Once the play/connect action is selected, the screen moves to Figure 4c. During this display the mobile device 100 is performing actions behind the scenes.

Once the user selects the Play / Connect action, the mobile device 100 takes step 4 shown on Figure 2. Turning back to Figure 2 step 4, this embodiment causes a circuit switch, cellular call to be made to the PBX/Voice-mail system 120. The actual phone number of the PBX/voice-mail system (and any password or DTMF access codes associated with accessing the voice-mail system of the mobile device user) could be in the original voice-mail summary message, or could be pre-configured/stored into the mobile device 100. To improve the integration of the solution, the PBX/voice-mail system is either configured to recognize the mobile device's incoming caller Id information, or the mobile device plays a secret DTMF tone sequence to uniquely identify it from the plurality of other mobile devices. To further enhance security both

caller ID information and the DTMF-based password may be used to authenticate the mobile device user. It is preferable that both the outgoing call to the PBX/voice-mail system and any exchange of DTMF tones between the mobile device and the voice mail system are accomplished without the need for user input or user intervention (i.e., no need to type in the password). In a preferred embodiment, the mobile device suppresses the DTMF tones associated with initiating and connecting an outgoing call to the PBX system/voice mail system. In the preferred embodiment, the DTMF tones may identify the particular voice mail message to act on. In this manner, the retrieval of voice mail messages is seamless and transparent to the mobile device user. After this step is complete, the voice-mail interface 120 and the mobile device 100 preferably automatically exchange DTMF tones to communicate. The DTMF tones can be pre-configured into the application on the mobile device 100, or the user could configure them depending on what the voice-mail DTMF commands are expected by the PBX system. For example, to play a voice mail message, the voice mail server may expect three 1s from the mobile device. In this case, the mobile device may be pre-configured to output three 1s as DTMF tones to the voice mail server when the user presses play. Turning to Figure 4c, there is an example list of the types of commands 265 that would be useful for a voice-mail system 120. For one skilled in the art, he or she understands that this is only an example list of commands. Some of the commands might have specific actions, like the hang-up command, would drop the communication link to the voice-mail server 120. In advanced voice-mail systems, 120 the normal hierarchical interactive voice response interface might be collapsed so that shorter, direct DTMF commands take the user directly to final actions.

Turning now to Figure 3, in this second embodiment the first three steps are preferably similar to those described in Figure 2. In step (1) a call arrives in for the user through the PBX system 120. It comes from a local company user 125, or from the outside world 230. Step 2 occurs because the user is away from their desk, so the message is placed into voice-mail storage 225. In step 3, the voice-mail interface component 210c, preferably within the unified messaging system 115, detects the voice-message has been stored or received and sends a notification message of the voice mail message through the wireless data network 150b to the mobile device 100. The notification message preferably includes one or more of the following information: telephone number of the PBX to make into all into, telephone number of caller, length of voice mail message and an identifier of the voice mail message. Upon receipt of the notification message, a summary message is preferably generated at the mobile device based on information from the notification message. As shown in Figure 4 the user sees the message 250 and has the option of opening the message as in figure 2. After opening the message the user selects the Play or Connect option, a data message leaves the mobile device 100. In this embodiment, the data message is a command to the unified messaging sub-system to request the PBX/voice-mail interface to initiate a circuit-switched call to the mobile device 100. The command is preferably sent via the wireless data network 150b from the mobile device and includes the identifier of the voice mail message. The unified messaging system 115 preferably is awaiting for such incoming commands from the mobile device 100. A central command processor 245 is present to watch for a particular command sequence, or some other data component. This command could be exchanged in e-mail, where the subject line, or the body has a special character sequence

to indicate that a PBX/voice-mail command is present. The email preferably would include the identifier of the voice mail message. In this manner, email may be the transport mechanism for remotely managing the PBX/voice-mail system.

In step 5 the voice-mail interface 210c uses preferably the PBX/voice-mail API calls to provide an outgoing voice circuit where a call is made preferably to the configured number for that user or the mobile device. The user is able to override this number by configuring another number in the mobile device 100 that will accompany the data command. Otherwise if the override number is absent, the default number will be used. There are several advantages to this method. First, the method provides greater security for both systems. The PBX/voice-mail system knows which mobile device number to call, and an incoming connection cannot be impersonated. This security can be further improved by removing the option within the mobile device 100 to override the default cell phone number. Secondly, in some wireless cellular networks the costs of accepting an incoming cell phone call is less than making an outgoing cell phone call.

When the PBX/voice-mail system 120 calls the mobile device, the mobile device may be configured to recognize the caller Id of the PBX/voice-mail system 120. This ability to recognize the incoming call is from the PBX/voice-mail system preferably allows the incoming call to be automatically accepted by the mobile device without the need for user input or user intervention (i.e., press the "talk" or "pick up" button to accept the incoming). In a preferred embodiment, the mobile device suppresses the ring tones or other notification of incoming calls (i.e., vibration) associated with such incoming call. In one embodiment, the user of the mobile device is not prompted for voice mail system passwords, etc. In this manner, the retrieval of voice mail messages is seamless and

transparent to the mobile device user. This seamless integration is possible because of the coordinated design between the two systems (the voice mail system and the mobile device). Similarly in Figure 4c, each time a DTMF tone is played by the mobile device to the voice-mail system, the user preferably does not hear these DTMF tones as the mobile device's speakers are preferably muted or suppressed. Once the user is done interacting with voice-mail they can perform the hang-up command action that would terminate the incoming voice circuit-switched connection.

C. MOBILE DEVICE DESCRIPTION

Turning now to Figure 5 there is a block diagram of a mobile device 100 in which the invention may be implemented. The mobile device 100 is preferably a two-way communication device having at least voice and data communication capabilities. The device preferably has the capability to communicate with other computer systems on the Internet. Depending on the functionality provided by the device, the device may be referred to as a data messaging device, a two-way pager, a cellular telephone with data messaging capabilities, a wireless Internet appliance or a data communication device (with or without telephony capabilities).

Where the device 100 is enabled for two-way communications, the device will incorporate a communication subsystem 311, including a receiver 312, a transmitter 314, and associated components such as one or more, preferably embedded or internal, antenna elements 316 and 318, local oscillators (LOs) 313, and a processing module such as a digital signal processor (DSP) 320. As will be apparent to those skilled in the field of communications, the particular design of the communication subsystem 311 will be dependent upon the communication network in which the device is intended to operate.

For example, a mobile device 100 destined for a North American market may include a communication subsystem 311 designed to operate within the Mobitex™ mobile communication system or DataTAC™ mobile communication system, whereas a mobile device 100 intended for use in Europe may incorporate a General Packet Radio Service (GPRS) communication subsystem 311.

Network access requirements will also vary depending upon the type of network 319. For example, in the Mobitex and DataTAC networks, mobile devices such as 100 are registered on the network using a unique personal identification number or PIN associated with each device. In GPRS networks however, network access is associated with a subscriber or user of a device 100. A GPRS device therefore requires a subscriber identity module (not shown), commonly referred to as a SIM card, in order to operate on a GPRS network. Without a SIM card, a GPRS device will not be fully functional. Local or non-network communication functions (if any) may be operable, but the mobile device 100 will be unable to carry out any functions involving communications over network 319. When required network registration or activation procedures have been completed, a mobile device 100 may send and receive communication signals over the network 319. Signals received by the antenna 316 through a communication network 319 are input to the receiver 312, which may perform such common receiver functions as signal amplification, frequency down conversion, filtering, channel selection and the like, and in the example system shown in Fig. 5, analog to digital conversion. Analog to digital conversion of a received signal allows more complex communication functions such as demodulation and decoding to be performed in the DSP 320. In a similar manner, signals to be transmitted are processed, including modulation and encoding for example, by the

DSP 320 and input to the transmitter 314 for digital to analog conversion, frequency up conversion, filtering, amplification and transmission over the communication network 319 via the antenna 318.

The DSP 320 not only processes communication signals, but also provides for receiver and transmitter control. For example, the gains applied to communication signals in the receiver 312 and transmitter 314 may be adaptively controlled through automatic gain control algorithms implemented in the DSP 320.

The mobile device 100 preferably includes a microprocessor 338 which controls the overall operation of the device. Communication functions, including at least data and voice communications, are performed through the communication subsystem 311. The microprocessor 338 also interacts with further device subsystems such as the display 322, flash memory 324, random access memory (RAM) 326, auxiliary input/output (I/O) subsystems 328, serial port 330, keyboard 332, speaker 334, microphone 336, a short-range communications subsystem 340 and any other device subsystems generally designated as 342.

Some of the subsystems shown in Fig. 5 perform communication-related functions, whereas other subsystems may provide "resident" or on-device functions. Notably, some subsystems, such as keyboard 332 and display 322 for example, may be used for both communication-related functions, such as entering a text message for transmission over a communication network, and device-resident functions such as a calculator or task list.

Operating system software used by the microprocessor 338 is preferably stored in a persistent store such as flash memory 324, which may instead be a read only memory

(ROM) or similar storage element (not shown). Those skilled in the art will appreciate that the operating system, specific device applications, or parts thereof, may be temporarily loaded into a volatile store such as RAM 326. It is contemplated that received communication signals may also be stored to RAM 326. As shown the flash
5 memory can be segregated into different areas for both computer programs 358, and program data storage 350, 352, 354 and 356. These different PIM storage types indicate that each program can allocate a portion of flash memory 324 for their own database requirements. Also shown as part of flash memory are sample memory elements 350. This might include but are not limited to configuration information, either entered by the
10 user or part of the manufacturing process, device state information, like the current radio network and region being used, address book information and other PIM information like calendar, tasks and to do lists.

The microprocessor 338, in addition to its operating system functions, preferably enables execution of software applications on the device. A predetermined set of
15 applications that control basic device operations, including at least data and voice communication applications for example, will normally be installed on the mobile device 100 during manufacture. A preferred application that may be loaded onto the device may be a personal information manager (PIM) application having the ability to organize and manage data items relating to the device user such as, but not limited to e-mail, calendar
20 events, voice mails, appointments, and task items. Naturally, one or more memory stores would be available on the device to facilitate storage of PIM data items on the device. Such PIM application would preferably have the ability to send and receive data items, via the wireless network. In a preferred embodiment, the PIM data items are seamlessly

integrated, synchronized and updated, via the wireless network, with the device user's corresponding data items stored or associated with a host computer system. Further applications may also be loaded onto the mobile device 100 through the network 319, an auxiliary I/O subsystem 328, serial port 330, short-range communications subsystem 340 or any other suitable subsystem 342, and installed by a user in the RAM 326 or preferably a non-volatile store (not shown) for execution by the microprocessor 338. Such flexibility in application installation and/or remote voice-mail system configuration increases the functionality of the device and may provide enhanced on-device functions, communication-related functions, or both. For example, secure communication applications may enable electronic commerce functions and other such financial transactions to be performed using the mobile device 100.

In a data communication mode, a received signal such as a text message or web page download will be processed by the communication subsystem 311 and input to the microprocessor 338, which will preferably further process the received signal for output to the display 322, or alternatively to an auxiliary I/O device 328. A user of mobile device 100 may also compose data items such as email messages for example, using the keyboard 332, which is preferably a complete alphanumeric keyboard or telephone-type keypad, in conjunction with the display 322 and possibly an auxiliary I/O device 328. Such composed items may then be transmitted over a communication network through the communication subsystem 311.

For voice communications, overall operation of the mobile device 100 is substantially similar, except that received signals would preferably be output to a speaker 334 and signals for transmission would be generated by a microphone 336. Alternative

voice or audio I/O subsystems such as a voice message recording subsystem may also be implemented on the mobile device 100. Although voice or audio signal output is preferably accomplished primarily through the speaker 334, the display 322 may also be used to provide an indication of the identity of a calling party, the duration of a voice call, or other voice call related information for example.

The serial port 330 in Fig. 5 would normally be implemented in a personal digital assistant (PDA)-type communication device for which synchronization with a user's desktop computer (not shown) may be desirable, but is an optional device component. Such a port 330 would enable a user to set preferences through an external device or software application and would extend the capabilities of the device by providing for information or software downloads to the mobile device 100 other than through a wireless communication network. The alternate download path may for example be used to load an encryption key onto the device through a direct and thus reliable and trusted connection to thereby enable secure device communication.

A short-range communications subsystem 340 is a further optional component which may provide for communication between the mobile device 100 and different systems or devices, which need not necessarily be similar devices. For example, the subsystem 340 may include an infrared device and associated circuits and components or a BluetoothTM communication module to provide for communication with similarly-enabled systems and devices.

D. REMOTE CONTROL OVER PBX SYSTEM

Another aspect of the invention is a direct remote control over the office PBX system 120. The illustration shown in Figure 6 closely follows the description provided in

Figure 3. In this illustration, the user of the mobile device 100 wants to set up a conference call. To perform this action, the user sends one or more commands through his mobile device to the unified messaging server 115 to request the resources of the associated PBX system 120. The example of a conference call is just one type of PBX service that could be requested using this method. Other methods that could also be used include, but are not limited to: a point-to-point call with one other person, calling a company extension, forwarding a voice-mail call to another number and other advanced call processing. Another embodiment, could also allow the user to submit data messages that would be converted from text to speech. This could include text messages to change the daily greeting, text messages to record extended absence prompts and other similar voice-mail related voice prompts.

Turning now to Figure 6 in this third embodiment of the invention, the user of the mobile device 100 sends a command to the unified messaging system 115 to request resources from the PBX system 120. The unified messaging server 115 then performs an action on behalf of the user based on the command that requests voice circuits from the PBX server 120 which in turn eventually engages the voice component of the mobile device 100. In step (1) of Figure 6 the user of the mobile device 100 invokes a conference initiate screen 275. This is just one example screen - there are many ways to present this information to a user of a small handheld mobile device. In this example, the user selects the conference participants or conferencees, most likely via an address book or contact database on the mobile device 100. Conferencees may be added or subtracted as needed until the user/conferencor is satisfied that the correct number of conferencees is present. This activity could also be preformed from the calendar program on the device. In this

embodiment, the calendar entry contains all the participants of a meeting, each is presented to the user when the time expires for the meeting. The user then confirms the participants and the meeting starts. Once the conference participants of the conference are selected the Start Call button is selected. This results in taking step (1) of this

5 embodiment, where the mobile device 100 sends a conference request command to the unified messaging service 115. The unified messaging service 115 recognized the command 245, and does not treat the message like data. As already mentioned, this command could come in an e-mail and have a special subject, or body command string that is being monitored to identify the e-mail as containing commands for a conference

10 call. The command is then passed over to the PBX/voice-mail interface 210c, which interfaces to the PBX system 120 to perform the requested actions. The command preferably includes the command type, the necessary phone numbers and any other necessary information to correctly execute the command submitted.

Step (2) now takes places as the PBX and voice-mail interface 210c uses the

15 applicable API to request resources from the PBX component 120. For our example this command is a request to set up a multiple-person conference call using the telephone numbers provided by the user in the original command. Preferably, the PBX system 120 sets up a voice call to the mobile device 100 since the mobile device is the requestor of the conference call and must be present. In step (3) the PBX system 120 then makes all

20 necessary phone calls using phone circuits to call the other parties 270 specified by the user. In our example there are three calls shown, this could be reduced or increased depending on the system. As user's pick up the call they could be played a canned message, like 'You are joining an electronically established conference call'. The

organizer of the conference call might hear a beep or a signal each time a new caller is connected. Alternatively, as each new conferencee is successfully contacted by the PBX (a new voice call connection is established), the voice call connection may be promptly connected to the mobile device to establish the conference call. Step (3) completes when
5 at least one call is established and the call proceeds. During the call the user that initiated the conference may 'suspend the call' or 'end the call'. These actions would also be sent using commands back through the wireless network data channel to the unified messaging server 115. Alternatively, the mobile device, through user input, could play DTMF tones to the PBX system 120 to change the state of the conference call.

10 There are many advantages to establishing a conference call using this method including, but not limited to: cost savings to the user of the mobile device 100, there is improved reliability in establishing the call, and there is a time savings as conference calls can take a lot of effort to get established on a mobile phone. The increased reliability to the mobile user is realized if the mobile user happens to roam during the call
15 itself. If the mobile phone goes into dead areas, or the call is dropped by the base stations, the circuit will be lost during the conference. If this were to happen the PBX system 120 would be programmed to re-call the user and establish the call again. In this way the PBX system 120 act as a proxy owner of the conference, not the mobile user, thus increasing the reliability and ensuring the conference continues despite bad wireless network
20 coverage situations.

Turning now to Figure 7 there is yet another embodiment of how a dual-mode mobile device 100 can use their data channel to remote control voice events to their handheld device. In this example the mobile device user 100 receives a call into their

land-line phone number. This could be a number provided by an ASP/IPS, network carrier or within their corporate office. Unlike Figures 2 and 3, the user has configured the PBX system 120 to hold the call and send a notification that the call has arrived (step (1). Step (1) summaries the incoming call with information that includes, but is not limited to: the caller Id, time of the call and any matching name information from preferably a locally stored address book. The summary message is given to the PBX and Voice-mail interface quickly and get delivered to the mobile device 100 quickly. Step (2) is the delivery of the message indicating a call has arrived and is on hold. During this time the calling party might be played a message like 'Please Hold while we contact the 'Joe Blow' for you'. If for some reason the command is delayed, or the mobile device 100 is out of coverage, the the incoming call is timed out and placed into voice-mail 225. However in most cases the command does reach the user of the mobile device 100 and they act upon the message.

The incoming notification event might cause a dialog box to appear 280, similar to that shown in Figure 7. This dialog box simply shows the caller Id, matching name and any other summary information that can be extracted from the caller. The user can then direct the PBX system 120 what to do with the call. In this case all commands will cause a response to go back to the unified messaging server 115. In step (3) the command reaches the unified messaging server 115 and it detects the command and gives it to the PBX and Voice-mail interface 210c. The command response will have a reference identifier for the held call so that the PBX and voice-mail interface 210c can direct the PBX system 120 what to do with the caller. In step (4) the PBX system acts upon the command and either sends the call to voice-mail 225, drops the caller, i.e. hangs up

immediately, or redirects the call to the mobile device 100. The user can even provide an override to the default phone number in the command response if necessary to tell the PBX system 120 where to send the caller.

Turning now to figure 8 there is a data flow diagram for the steps necessary to perform one embodiment of the invention. In this illustration the user of the mobile device 100 is requesting to play a voice-mail message. This data flow follows the steps shown in Figure 3; although comments about Figure 2 will also be mentioned. The data flow starts when a call is received for the user 400. The call is handled by the PBX system 120 and directed to the user's phone, which could be a phone number hosted by a network carrier, an ISP or an ASP 402. Since the user is not present the PBX system directs the call to voice-mail where a message is recorded and stored 404. Since the PBX/voice-mail interface is monitoring all activity through the available API, it is informed or detects the new voice message arrival. It then builds a summary of the call via the API, and determines the Id of the user receiving the voice-mail message 406. The PBX/voice-mail interface then determines if the user that received the voice-mail message has a mobile device 100 capable of supporting this advanced functionality 408. If the user does not have a mobile device 100, then the summary message is not sent to the wireless network 150b and the voice-mail message is ignored 410 (the user may access the voice-mail message as he or she traditionally would from his or her desktop telephone at, for example, the office). Otherwise the summary message is placed in the unified messaging system storage area to be scheduled for delivery to the mobile device 412. The unified messaging system then sends a summary of the message to the mobile device user 414. The mobile device user 100 is then notified following the setting on the

mobile device 416. The user responds immediately, or at a later date, to the voice-mail summary message that is shown in the unified event screen. The user opens the message and selects a Play or Connect while viewing the details of the message 418. In the embodiment described in figure 2 and figure 3, this is where the two methods vary. In figure 2 the next step is to call the PBX system and proceed from step 430. In the embodiment described by Figure 3 the mobile device 100 prepares a response message containing the voice-mail message reference number, an overriding callback phone number, any authentication information for security, and any other pertinent information 420. The message is then sent and received by the unified messaging server 422. The command is recognized and the type matches a voice-mail command, so it is given to the PBX/voice-mail interface 424. The PBX/voice-mail interface determines that the user wants to play-back a previously recorded message, and provides the necessary information to locate and execute this command 426. If the command is not a voice-mail playback command then the invention proceeds to process one of the many other types of commands that have been discussed 428. Otherwise the PBX/voice-mail interface proceeds to start executing the command 430. The first step is to determine if the voice-mail message is still available in storage 432. If the message cannot be found the processing ends for this command 434. Otherwise the PBX/voice-mail interface determines if there is an override number present 436. If there is no override number then the configured default number for the mobile device user is used 438. If an override number is present then the override callback number is used 440. The PBX/voice-mail interface then calls the mobile device 100, using PBX phone circuit resources 442. The mobile device 100 recognizes the incoming call from the PBX system and accepts it

automatically. In one embodiment, the user is preferably not notified of the incoming call from the PBX and the accepting step is accomplished without user involvement. A voice call is then established between the mobile device and the PBX for access of voice mail system functionality. At this point, the user is able to interact with the PBX and voice mail system 120 through a voice mail graphical user interface 260, 265 on the mobile device. Upon selection of one or more of the voice mail GUI menu items, the mobile device can issue control signals, for receipt by the voice mail system, to initiate the action associated with the selected menu item. In one preferred embodiment, the control signals are DTMF tones or a sequence thereof associated with the requested action. Preferably, said issuance is accomplished with the speaker of the mobile device muted or suppressed so that the user is not necessarily hearing said DTMF tones to thereby provide a more user friendly, seamless and transparent user interface to the voice mail system. It should be understood that an audible notification of the selected voice mail action has started or ended is still possible while still suppressing said DTMF tones. The user might simply listen to the requested message, they might delete the message, forward the message or simply hangup. The user might also go to the previous message, the next message or scan their entire voice-mailbox for a certain message. A test scan is performed to watch for a hangup command 446, and if one is entered by the user the call is ended 448. The system also watches for the loss of the carrier, indicating the user simply hung-up on the call without using the menu options 450. If the carrier is lost spontaneously the call is ended 452. Otherwise the system loops around and continues to watch DTMF tones for processing 444. At some point the user completes the call and either issues a hangup command, or drops the carrier on the phone circuit.

Turning now to figure 9 this is a data flow diagram that illustrates the steps in figure 6. In this embodiment the mobile device 100 is requesting a conference call via a data command sent to the unified messaging system 115. The first step in this data flow diagram when the user decides to construct a conference call command 500. The command contains the conference request, the names and optionally the phone numbers of the other attendees in the conference and any security information that might be needed. This message is sent to the unified messaging server 115 and it identifies the message as a PBX/voice-mail command and gives it to the PBX/voice-mail interface component 502. The PBX/voice-mail interface extracts the phone numbers, mobile device 100 identifier and other information from the command 504. The PBX/voice-mail interface interacts with the PBX and passes the numbers for the conference call 506. The PBX/voice-mail interface monitors the calls and first determines whether the call to the conference organizer was successful 508. If this call fails then there is no point in having a conference, so the call is dropped and the command aborted 510. If the organizer is in coverage and the call is answered the PBX system 120 is instructed to continue with the conference and make the remaining phone calls to the conference attendees 512. During this step a timer is started to ensure that the command does not wait forever for calls that cannot be completed 514. The system also waits and watches for completed phone circuits for the conference attendees 516. If an attendee does answer the call the conference call timer is lengthened 518, but this is only done once. Since the call has started successfully, with at least one attendee the other call attempts can be allowed to wait longer 518. Each time an attendee is connected an optional short message is played telling them they are starting a conference call – the organizer's name may also be part of

this recorded message 520. The new call is then bridged into the organizer's circuit and the call can be considered started 520. A test is performed to see if this call was the last attendee expected 522 and if so the conference is continues and no further waiting is performed for new circuits. Otherwise the software returns to wait for additional circuits to be closed – i.e. calls to be answered 516. If the call conference timer expires 526, it may be a short or longer timer that has expired 526. A check is performed to see if any of the calls that were attempted were successful 528. If no call was successful in the allotted time, all circuits are closed, all pending calls terminated and the organizer's circuit is also closed 530. Otherwise, all pending circuits are closed and the conference continues with those parties that have answered their phones 524.

Turning now to Figure 10 this data flow illustrates the embodiment of the invention highlighted in figure 7. In this example an incoming call arrives and the mobile device 100 is told of the incoming call and given a choice of various actions. This data flow starts with the arrival of the call into the PBX system 120 associated to the user 600. This could be within the network carrier, in an ASP/ISP environment, or within the corporate office. If the call is answered by the user 602, then there is nothing to do and the call is accepted 604. Otherwise the call is detected by the PBX/voice-mail interface, via the API provided by the PBX system 606. The PBX/voice-mail interface determines whether the user receiving the call has a mobile device 608. If the user does not have a mobile device 100 the call is allowed to go into voice mail 610. Otherwise the PBX is requested by the PBX/voice-mail interface 210c to hold the call and play a 'please hold while we contact the user' message 612. A summary of the call is sent to the mobile device 100 that includes the caller id, time of call and any other information that might

exist 614. The call-holding summary message is placed in the unified messaging system storage area 215, so that it can be delivered by the unified messaging system to the mobile device 616. After the message is sent the PBX/voice-mail interface runs a timer to ensure the call on hold does not wait too long 618. If the mobile device 100 is out of coverage it is possible the message will take too long to reach the user. Once the message is received the user has to decide quickly to act upon the message. If they ignore the message or decide to do nothing then a default action will be taken 620. In most cases the default action will be to send the caller into voice-mail; but for one skilled in the art any number of configured choices are possible. If they ignore the message, or if they take too long and the timer expires, the call will be sent into voice-mail 624. If the user does act upon the message they can make a selection from various choices like hangup, send to voice-mail and forward to the mobile device 100. These are just a few choices, but there could also be a forwarded to another phone number that does not belong to the user being called or another canned message could be played. When the command is selected by the user it is packaged into a format understood by the unified messaging server 115 and sent back over the wireless network to the unified messaging server 628. The unified message server 115 detects that this is a PBX and voice-mail command and passes the message to the PBX/voice-mail interface 630. The PBX/voice-mail interface then instructs the PBX /voice-mail sub-system 120 what to do with the held call 632. In this situation the PBX system 120 either hangs up the call, sends it to voice mail, or forwards on to the user's mobile device 634.

These are four examples of many preferred embodiments of a method and system for remotely controlling a host system from a dual-mode communications device. This

invention also makes direct use of the patented invention for pushing information to a mobile data communications device. These two inventions augment each other to produce a dual-mode resulting action on a single device. Another interesting advanced implementation might allow a user of a dual-mode phone to co-ordinate a three-way
5 video-phone call from the mobile device.

It will be appreciated that the above description relates to a preferred embodiment by way of example only. Many variations on the invention will be within the scope of those knowledgeable in the field, and such variations are within the scope of the invention as described and claimed, whether or not expressly described.

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